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SSD-TDR-63-91-III

PROGRAM 706

FIRST QUARTERLY PROGRESS REPORT

TASK 3. LINEAR SHAPED CHARGE SEPARATION TESTS

AF04(695) - 273

20 April 1963

RADIO CORPORATION OF AMERICA
DEFENSE ELECTRONIC PRODUCTS
AEROSPACE COMMUNICATIONS AND CONTROLS DIVISION
BURLINGTON, MASSACHUSETTS

PB 2085-3 cw

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NOTICES

FOREWORD

This technical report describes progress in the first reporting period of a test program to obtain environmental susceptibility and shock transmission data for a stage separation system.

The report was written by:

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S. Dulevskis
R. R. Batchelder.

ABSTRACT

A flexible linear shaped charge (FLSC) for vehicle stage separation has been designed. The pyrotechnics have been acceptance tested for susceptibility to handling shock and electromagnetic radiation. A technique for verifying alignment of the installed FLSC by radiograph has been developed. Instrumentation techniques and test plans have been developed for measuring the shock effects on a spacecraft structure from firing the FLSC separation system.

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INTRODUCTION

Task 3 under contract AF04(695)-273 is the performance of linear shaped charge separation tests. This task is an orderly investigation of shock transmission from a flexible linear shaped charge (FLSC) stage separation device through a large space satellite. Of specific interest is the shock attenuation with distance from the separation plane and the shock pulse shape or shock response of resonators at various frequencies, (the shock spectrum).

Three identical shaped charge separation systems will be tested. Each one will be mounted within an interstage structure configured for the P706 program. Figure 1 shows the shaped charge general arrangement. Figures 2 and 3 show a cross section of the shaped charge separation system and the installation technique. Each interstage/separation system will be subjected to one of the following environments prior to the actuation of the separation system: (1) hard vacuum, (2) vibration (3) thermal pulse simulating aerodynamic heating. The test program will provide shock data from all three tests for correlation, and will provide basic data on the effects of these environments on the separation system.

The test program provides for x-ray examination of each installed separation system to assure it is positioned properly. The program also provides for inspection of the severed interstages to determine the ratio of the cut to the fractured depth of metal, and to observe if there is any appreciable variation in this ratio about the circumference of the interstage.

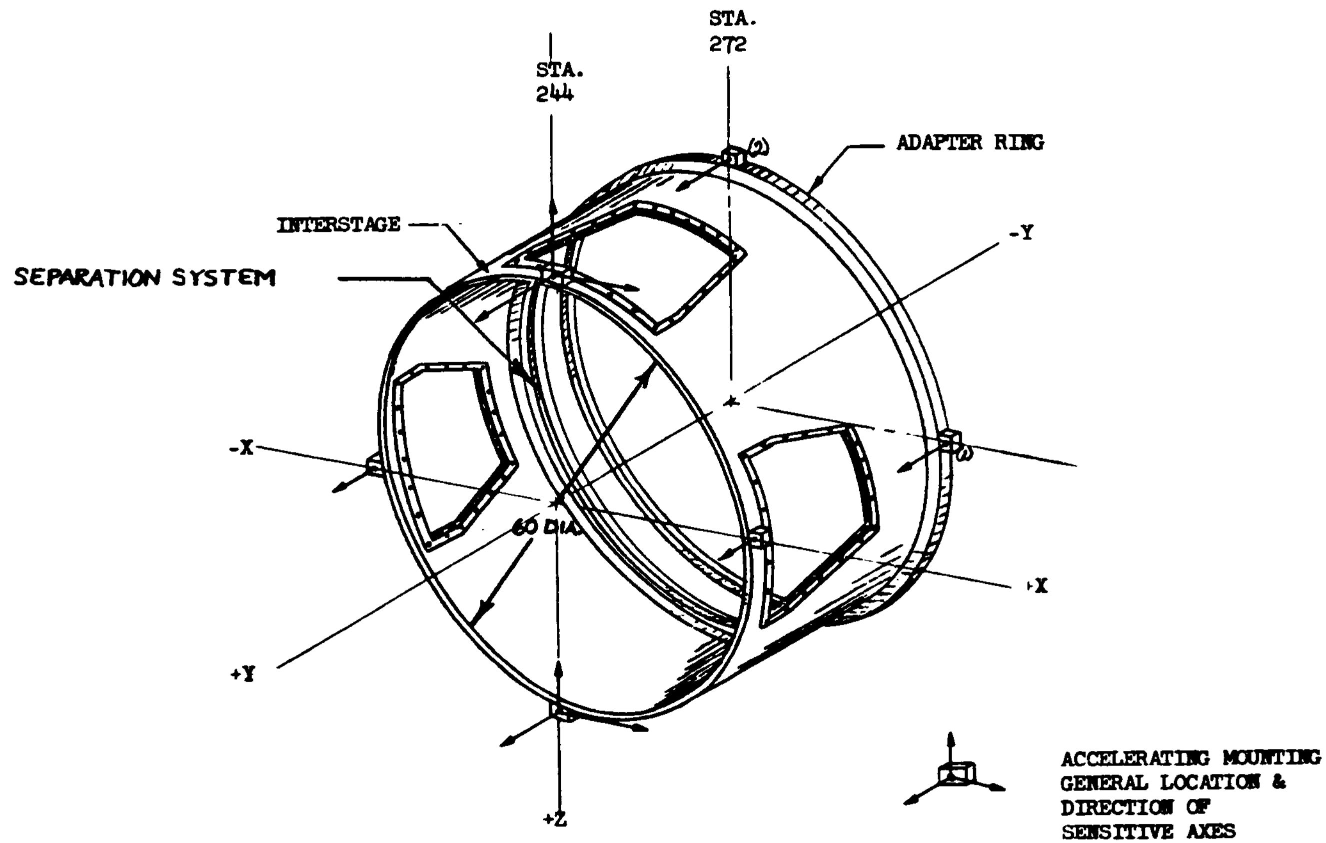

Figure 1. Interstage structure separation system

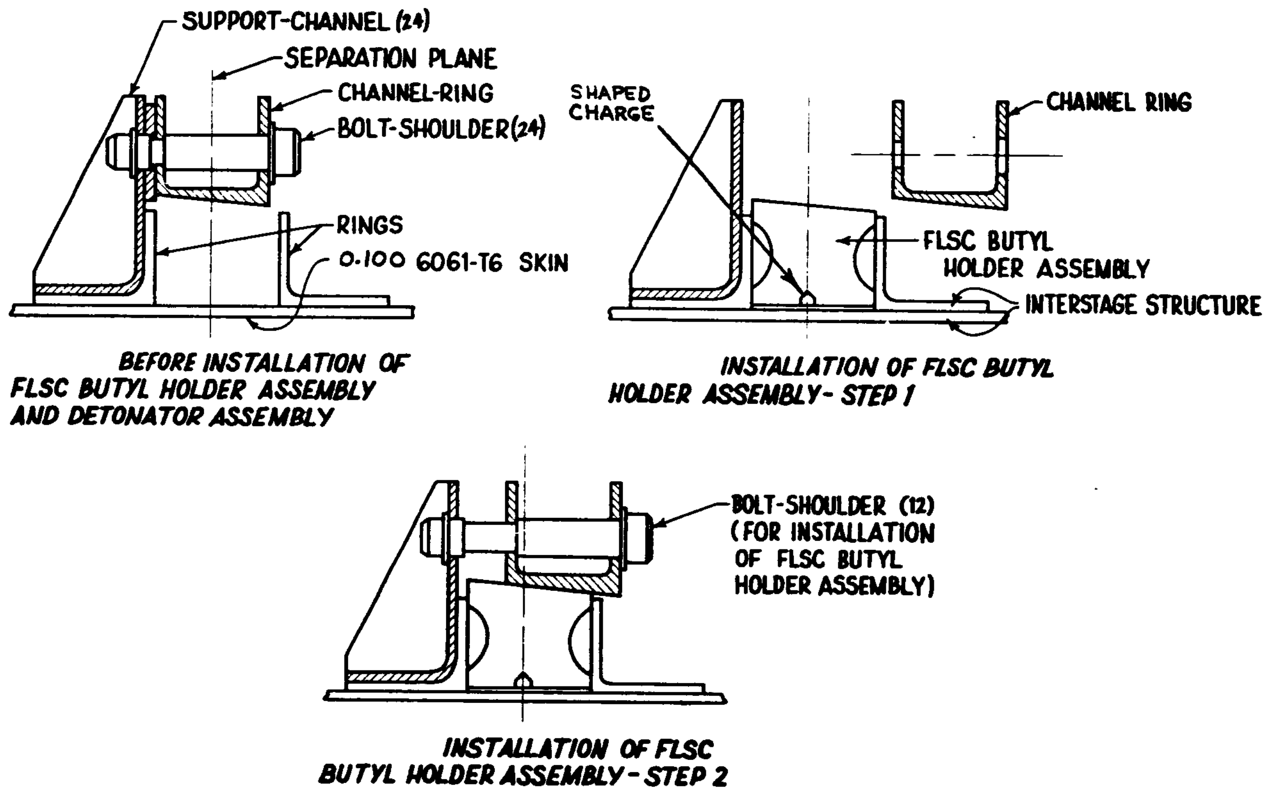

Figure 2. Separation system installation (A)

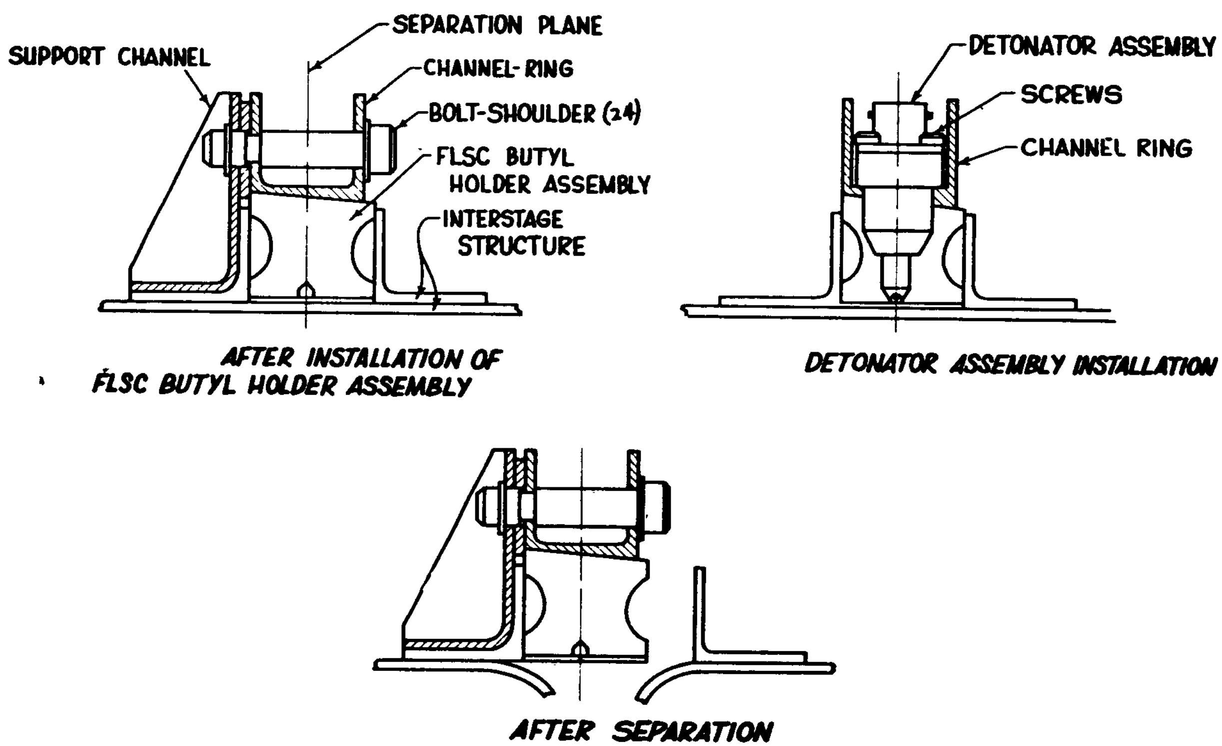

Figure 3. Separation system installation (B)

SUMMARY

The work accomplished this quarter was primarily in the area of test preparation. In particular the instrumentation technique study report was completed this quarter and describes in detail the instrumentation, sensor locations, the recording equipment to be used, and the data reduction technique to be employed. In the data reduction area the instrumentation report is enlarged by Section 1 of this quarterly report to include the further study made since the report was written.

Section 1.4 is a description of the reed group instrumentation to be used to determine shock response in the frequency range of 100 to 1000 cps.

A description of the fixtures which are to be used in this test program is contained in Section 1.5. Figure 4 shows a sketch of the special thermal fixture to be used.

Section 2 describes the acceptance tests performed on the linear shaped charge and the detonators used to ignite the change. In Section 3 the work performed in developing the x-ray techniques to be used during this test program is presented.

Section 4 presents the conclusions drawn to date and the recommendations for additional tests to be performed in conjunction with the present shaped charge test program.

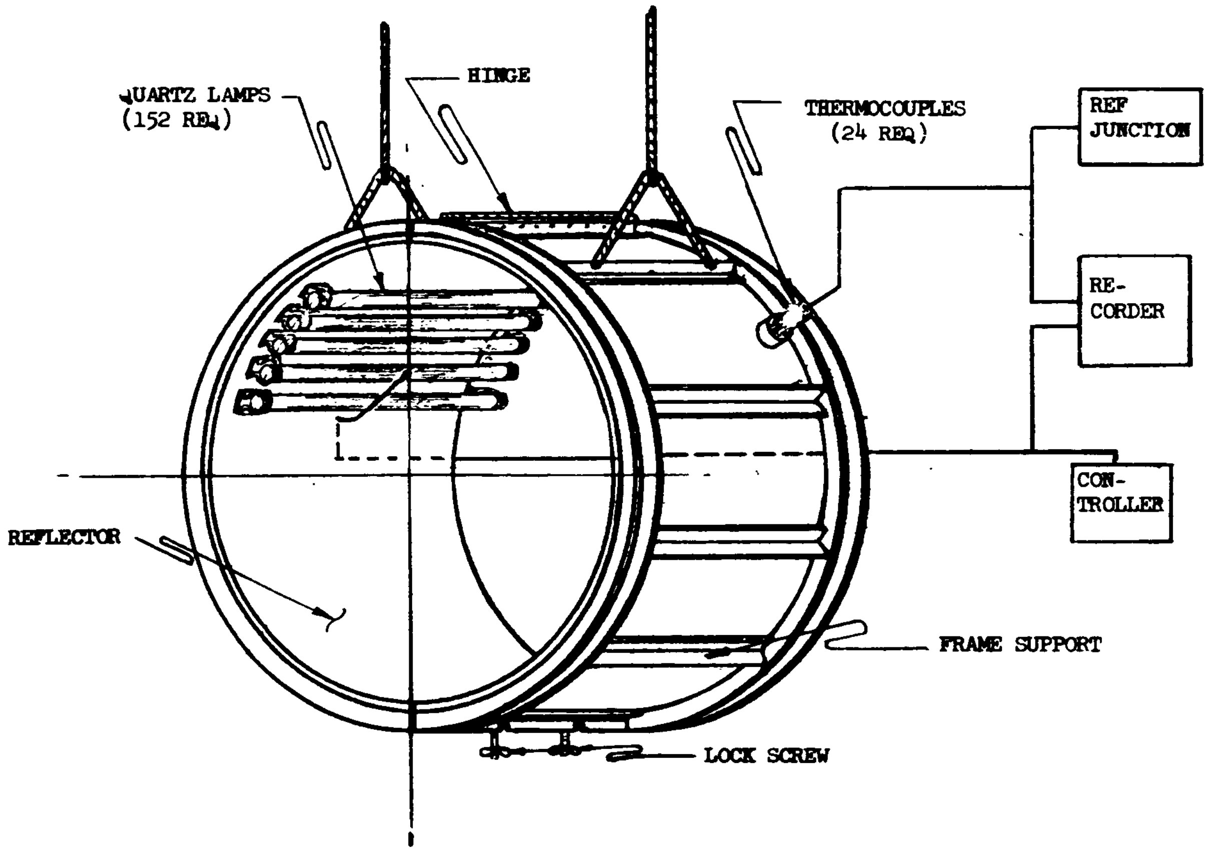

Figure 4. Plan-trajector furnace

SECTION 1

INSTRUMENTATION

1.1 THE CR-5 REPORT

RCA completed the Instrumentation Technique Study Report, CR-5, on 8 March 1963. This report contains a discussion of shock affects on structure, sensor and recorder selection, and sensor installation design. Fabrication of parts for the attachment of sensors to the FSV, and assembly of instrumentation as specified in the report are underway.

1.2 SHOCK DATA

Shock data from a separation test on another vehicle have been made available to RCA by SSD; shock responses of the P706 FSV are expected to be similar to these data. Since decay of the sensor output signal amplitude is relatively rapid, spectral analysis of the signal by narrow band-pass filter is not useable because of the long response time of available filters. Fourier analysis of the output signal, however, will yield principal harmonic components of the signal which define points on the shock spectrum.

At frequencies below about one third that of the sensor installation primary mode, the resonant responses of an oscillator to the sensor output signal and to the true shock excitation will be approximately the same. Figure 1-1 is a comparison of oscillator response vs resonant frequency for the two cases of excitation by sensor output and shock pulse. As stated in the Instrumentation Report, the duration of the shock pulse is expected to be less than the period of the primary sensor installation mode.

1.3 DATA REDUCTION

Techniques of data reduction which have been considered are summarized in Table 1-1. RCA proposed the use of a digital computer program for both the Fourier and the response analysis of the sensor output signal.

RCA has initiated programming of a routine to perform the following operations:

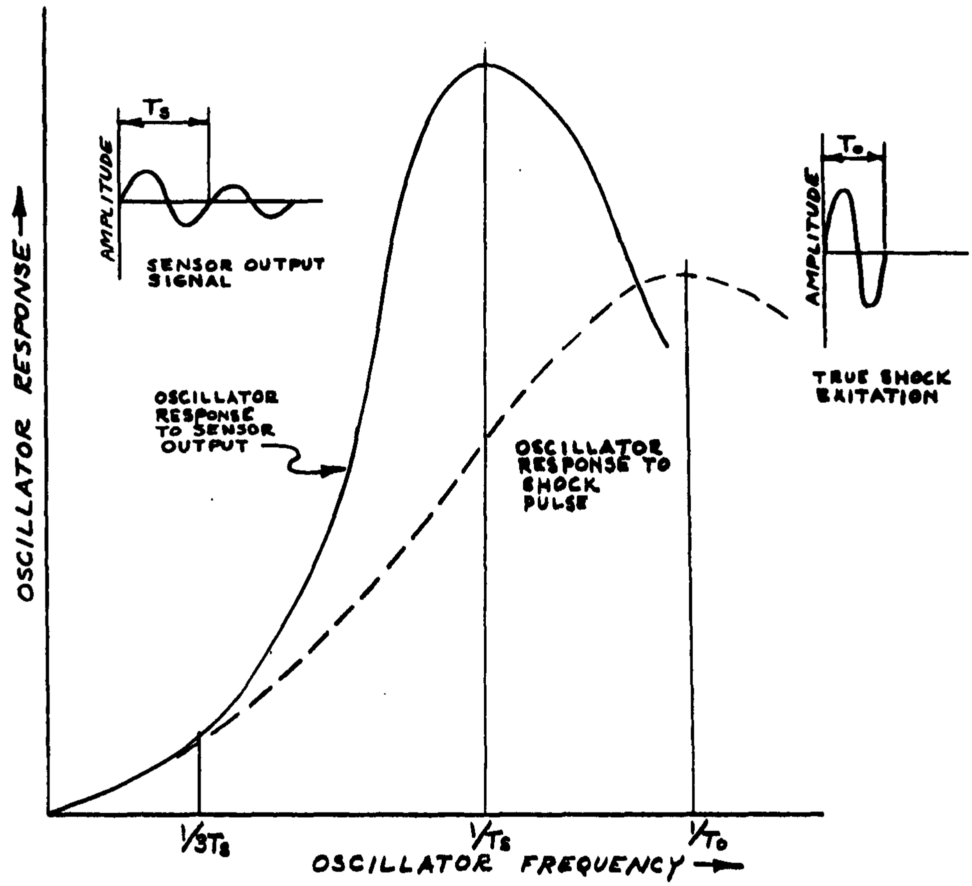

Figure 1-1. Generalized response of simple oscillator vs resonator frequency

Table 1-1. Data reduction technique

Analysis Mode	Equipment	Rec.	Budg.	Frequency Range	Major Limitation
Spectral (Fourier)	Visual	*	*	10 - 7000	Poor resolution of harmonics
	Tuned Reeds	*	*	100 - 1000	Discrete responses, many sensors
	Digital Comp.	*	*	100 - 2000	Requires A/D conversion
	Tape/TP		*	10 - 7000	Long response time (10 ms)
	Drum/TP		*	120 - 7000	Ditto, equipment not available
	Simoramic			?	Characteristics not known
Response	Manual	*		10 - 500	Applicable to major harmonics only
	Digital comp.	*		10 - 500	Assumes sensor response ≈ excitation Requires A/D conversion
	Analog comp.			10 - 500	Assumes sensor response ≈ excitation

Given an acceleration function a(t) described by arguments, a, at equal time intervals Δt,

(1) Determine the p largest amplitudes, A_m or B_n, of the harmonic components of the acceleration function and their frequencies in the bandwidth $\omega_A < \omega < \omega_B$. These amplitudes are coefficients of the Fourier representation of a(t);

$$a(t) = \sum_{m=1}^{m} A_m \sin \omega_m t + \sum_{n=0}^{n} B_n \cos \omega_n t$$

(2) Determine absolute maximum oscillator acceleration responses, $|\ddot{X}|$, at discrete frequencies ω in the bandwidth $\omega_1 < \omega < \omega_2$ from the equation

$$\ddot{X} + \omega^2 X = - a(t)$$

For the first separation test in the vacuum chamber, shock sensors are installed at three hard and four reed-mounted locations only. AVCO plans to record the sensor outputs on two magnetic tape recorders, leaving five channels un-used under current plans. RCA proposes to install an additional group of four reed-mounted sensors in the interstage to define the shock spectrum shape below 1000 cps more completely, provided the flat sample tests demonstrate effective performance of the reeds. Fabrication of two additional reed groups is underway.

1.4 REED GROUP

A group of cantilever reeds installed near the separation plane in all separation tests determines the magnitude (in g's) of the shock spectrum directly at discrete frequencies. RCA drawing 1672581 shows the group with reed design frequencies of 100, 200, 400 and 800 cps. One reed group has been machined, tuned, and heat treated; a spare group has been rough-machined only. RCA drawing 1672581 is part of report CR-5.

The reed design weights included one ounce for an Endevco model 2213 accelerometer. When tested under a steady sinusoidal load, the measured reed resonant frequencies were 10-20% below the design resonant frequencies, because of the relatively large rotatory inertia of the one ounce accelerometer mounted on the reed tip. Endevco type

2221 accelerometers are more compact and have been substituted on the reeds to provide higher resonant frequencies and more repeatable responses since the reed tip rotation in the primary mode is less. The relative characteristics of the accelerometers are tabulated below:

accelerometer model	2221	2213
weight (oz)	0.39	1.00
sensitivity (mv/g)	13	34
peak shock response (g)	2000	10,000
resonant frequency (cps)	30,000	35,000
mounting (screw thread)	No. 6-32	No. 10-32

The type 2221 accelerometer satisfies all reed instrumentation requirements as well as type 2213 does.

A second reed bank has been designed with resonant frequencies midway between those obtained from calibration tests of the first reed bank. The second bank is identical to the first, except for reed thicknesses. Fabrication of the second bank is complete, and calibration will be accomplished in time for installation of the bank on the first full-scale interstage prior to separation.

Reed parameters are summarized in Table 1-2. The first part of this table contains mode frequencies and transmissibilities obtained from the calibration test of the first reed bank at 4g steady sinusoidal input. In the test frequency bandwidth (10-3000 cps), the modes noted were the only peaks present in the output signal. The latter part of the table contains design frequencies in sequence for both reed groups. Frequencies of the first reed group have been adjusted to compensate for a special accelerometer mounting stud which will be used in shock tests, but which was not available during steady load calibration tests. The special stud will not appreciably change the reed resonant frequency, but it will provide assurance that the accelerometers are firmly mounted and that the calibration is repeatable.

Note that the importance of the data in Table 1-2 lies in two areas:

(1) The transmissibility (Q) must be high enough so that the reed response to an impulse shock is essentially the same as the response of an undamped resonator. If Q is greater than 10, the reed shock response differs by less than 10% from the undamped response.

(2) Design frequencies are chosen to give a uniform spread of data points in the bandwidth of interest. Frequency of the

Table 1-2. Reed bank resonance data

Reed bank I, tested at 4g input

First mode		Second mode	
f	Q	f	Q
140	17	1170	14
270	19	1920	9
550	12	1630	2
1010	30	not measured	

Summary of calculated resonant frequencies

Reed bank I	Reed bank II
125	185
245	370
495	710
920	1350

resonant response to shock will be obtained from the recorded shock response output signal.

1.5 FIXTURE DESIGN

The test program requires the following special fixtures:

(1) Ballistic pendulum reaction mass
(2) Thermal element support frame
(3) FSV bracket supports
(4) Accelerometer hard mounts

The interstage is suspended between two reaction masses in a ballistic pendulum arrangement. Each pendulum reaction mass consists of a weighted steel frame which is attached to a steel plate that is bolted to one end of the interstage around its circumference. The pendulum masses weigh approximately 1200 pounds each and simulate the two stages of the P706 space vehicle that are attached to the ends of the interstage. During the vacuum test both reaction masses are used. For the other two separation tests one of the reaction masses is replaced with the weighted P706 satellite structure which is instrumented to measure shock transmission. The pendulum fixtures were fabricated during this reporting period.

The thermal support frame is a hinged split ring, 72 inch diameter, cylindrical, and 14 inches long, that surrounds the interstage during the thermal trajectory simulation. The inside of the cylinder is lined with asbestos over which is an Alzac aluminum reflector. The thermal source consists of 152 high performance quartz lamps positioned 1.5 inches on center adjacent to the reflective surface. Power for the lamps originates from a programmed 400 kw power supply. The design of the thermal fixture was approved and the drawings released for fabrication during this reporting period.

The P706 final stage structure (the test satellite) is supported as a ballistic pendulum by four simple brackets as shown in Figure 1-2. To this structure will be mounted dummy masses simulating the actual equipment weight. This equipment is available from P706 inventory. The support brackets were released for fabrication during this reporting period.

The accelerometer hard mounts are described in CR-5 by RCA drawings. Their specific locations are also indicated in CR-5. These supports have been fabricated during this reporting period.

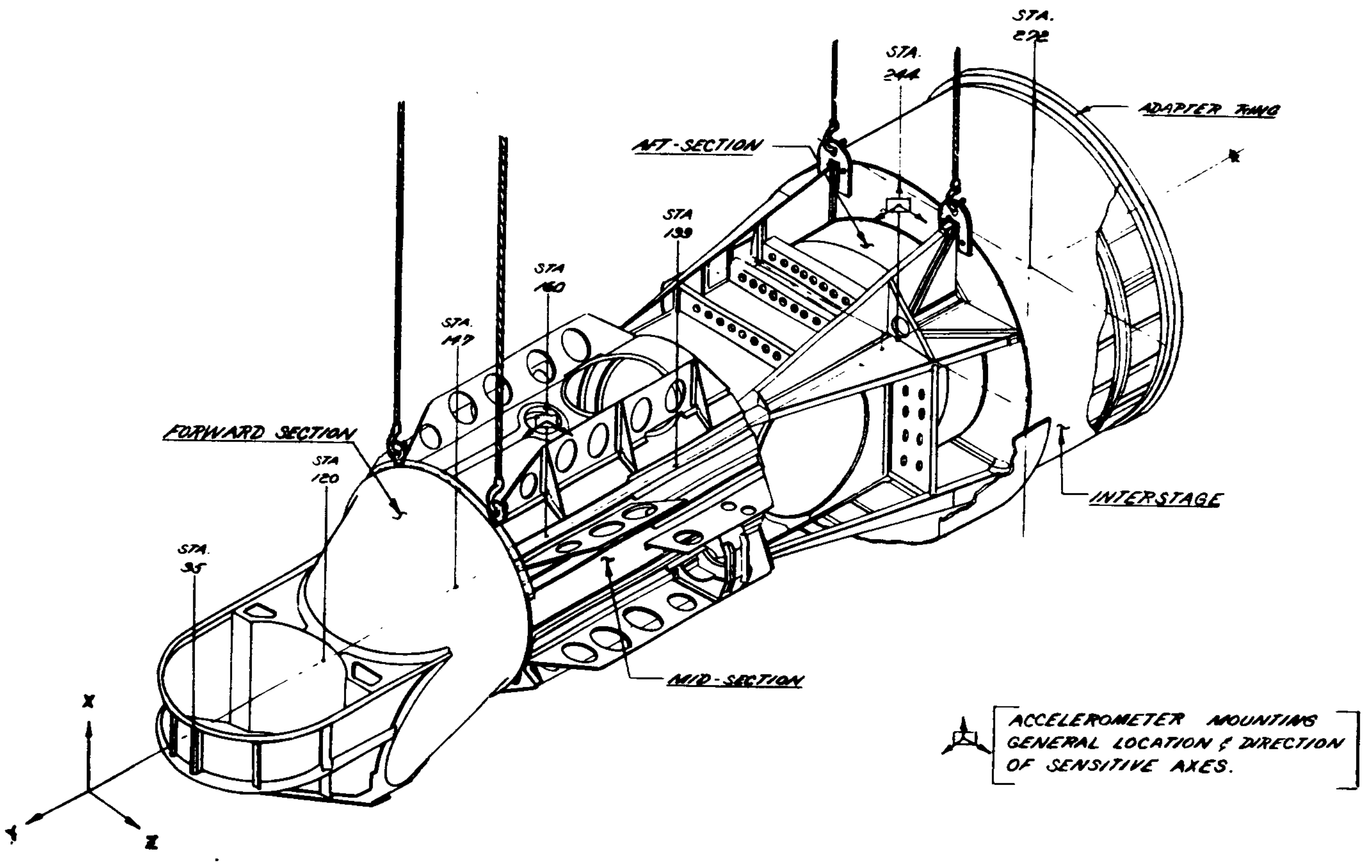

Figure 1-2. Final stage structure

SECTION 2

FLSC AND DETONATOR ACCEPTANCE TESTS

The purpose of the acceptance tests is to assure the compliance of detonator assemblies and flexible linear shaped charges (FLSC) with the procurement specifications, and especially to establish that the consistency of the core and sheath of FLSC is proper and that they are free of foreign matter, voids, and sheath intrusions. The acceptance tests are required by Test Procedure, RCA TP3-1, paragraphs 4.2.1 and 4.2.2.

The detonator acceptance tests consist of an inspection to insure compliance with AVCO drawing 400612, and with product marking, workmanship, and precautionary measures, such as proper installation of the shorting device on the electrical connector pins. Other detonator tests establish the bridge wire resistance, the insulation resistance, and the no-fire current. Detonator firing time is determined by firing four randomly selected detonators from a total of 25 detonators that have previously passed the other acceptance tests.

FLSC acceptance tests consist of an inspection for compliance with AVCO drawing 400618, and with product marking, workmanship, and an RF radiation susceptibility requirements. Additional tests of the detonating cord were previously performed by the manufacturer and included chemical analysis, tests for compliance with the specification MIL-R-00398B, measurement of velocity of detonation, core weight (per linear foot) determination, and radiographic examination.

The acceptance tests of detonator assemblies were conducted during this reporting period except for the firing of four detonators. Significant test results are within the specification limits. (See Appendix I; two AVCO test data sheets of 3/20/63 and 3/21/63.)

Twelve specimens of FLSC were selected for tests consisting of shock (20 foot drops, and 1 inch diameter 5 pound rod drop from 30 inch height), high temperature, and RF susceptibility. Test results are within the acceptable specification limits. (See Appendix II; six AVCO test data sheets of 3/18/63 and 3/19/63.) The accepted articles will be used in the three interstage tests to be conducted subsequently.

SECTION 3

X-RAY TECHNIQUES

The purpose of the x-ray examination of the assembled separation system is to assure proper FLSC alignment prior to environmental tests and to determine after the vibration test if there was any change in the position of the FLSC. Radiographic examination of the components, where applicable, are part of the acceptance tests and therefore, only x-rays of the assemblies are taken.

Two x-ray techniques are used. One consists of placing a dense metal wire marker on the outside of the interstage skin. Then, by taking radiographs in the longitudinal direction at discrete points about the circumference of the interstage, a cross section of the lead sheath of the FLSC and the wire marker will appear on the radiograph. Comparison of the distance between the two is made on the radiograph to establish the relative deviations.

A 360° circumferential x-ray exposure of the interstage will be made in the radial direction to establish that the FLSC is free from breaks and kinks. An indexing and positioning system during the x-raying will insure the proper identification of the radiographs.

During the report period, the x-ray techniques were developed for the examination of the (FLSC) detonating cord while it is assembled in the interstage structure. Radial (full 360°) exposures to show the necessary detail of the FLSC while assembled in the interstage required no special techniques. Using a rod anode x-ray tube (see Figure 3-1), acceptable radiographs were obtained. Longitudinal shots that show the stand-off distance of FLSC to interstage skin were tried in various combinations of exposure times, current intensities, and film sensitivities. For x-ray shots parallel to interstage skin thickness, the quality of film plate detail and definition was poor, being severely hampered by the heavy rings at the ends of structure and rings immediately adjacent to the FLSC holder assembly. To overcome this, the interstage structure was tilted in increments of 1 inch (see Figure 3-2) and again x-rayed at combination of current intensities, exposure time, and film sensitivities to bring out the required detail. When the tilt was great enough (approximately 5 inches) for x-ray beams to pass by major aluminum obstructions a more detailed film plate could be made. The tilt method will give a good comparative picture of the

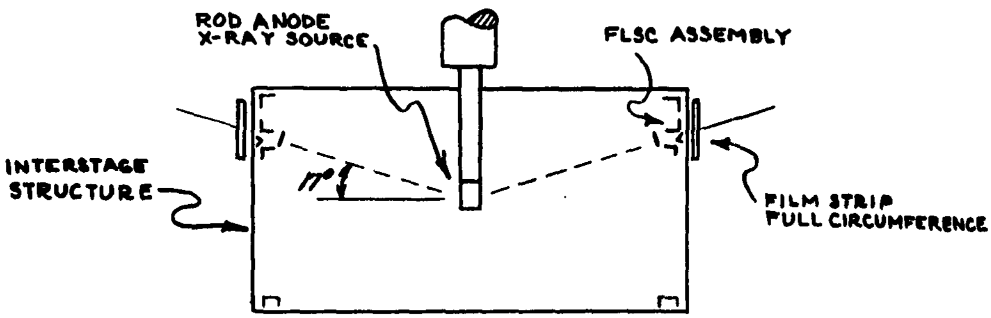

Figure 3-1. FLSC/interstage x-ray methods, radial (360°) exposure

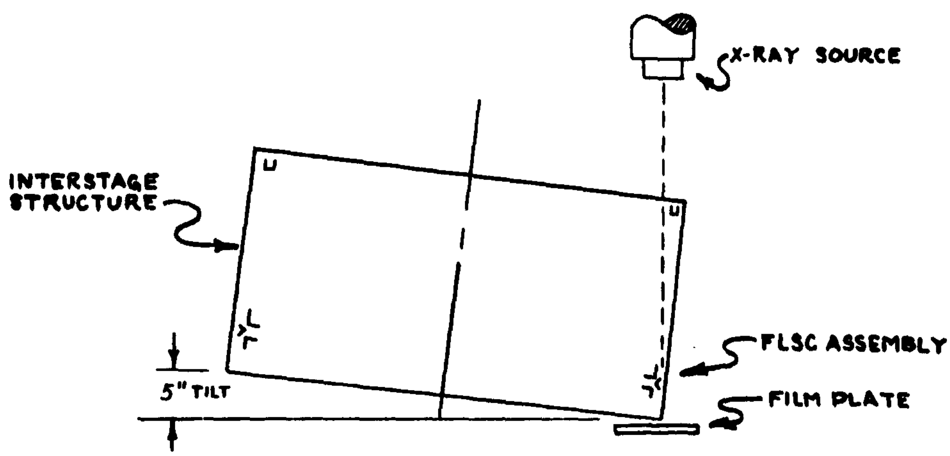

Figure 3-2. FLSC/interstage x-ray methods, longitudinal exposure

condition of the FLSC and of dimensional changes that could result from the environmental testing. The following is a tabulation of radiographic exposure data arrived at for the radial and longitudinal exposures that will be taken on FLSC-Interstage Assembly:

Description	Radial (360°) Rod Anode Tube	Longitudinal 5 inch Tilt
Kilovoltage	100	110
M.A. Minutes	5 M.A. 1-1/2 Minutes	10 M.A. Minutes
Film Type	Dupont No. 510	Dupont No. 510
Screens	None	None
F.F. Distance	30 inches	36 inches
Tube/Focal Spot	.4 mm	.4 mm
Film Density	2.0	2.0
Remarks	Develop 5 min. at 68°F	Develop 5 min. at 68°F

SECTION 4

CONCLUSIONS

Although no final conclusions can be drawn at this time, initial indications are that the techniques to be employed in obtaining the test data will be adequate, and that facilities and ancillary equipment will be sufficient to achieve a successful test program. Further, the acceptance tests assured successful firing of the shaped charge system. In addition, the x-ray methods will assist in the examination of the separation system.

APPENDIX I

AVCO DATA SHEETS, DETONATOR ASSEMBLY

RAD 6-006 4-63

Avco CORPORATION | research and advanced development division
201 Lowell Street · Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST
400 623 (Connectors)
DETONATOR ASSEMBLY PT. No. 400612-1

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G 310-010-0002	RESISTANCE & INSULATION RESISTANCE	

S/N	Millivolt DROP	RESISTANCE	INSULATION RESISTANCE				
1	4.7 MV	.470Ω	>100K MΩ				
2	4.45	.445Ω					
3	4.35	.435Ω					
4	4.80	.480Ω					
5	5.00	.500Ω					
6	4.80	.480Ω					
7	4.60	.460Ω					
8	4.80	.480Ω			CALIBRATION	CURRENT	10 MA
9	4.60	.460Ω					
10	4.45	.445Ω					
11	4.90	.490Ω					
12	4.95	.495Ω					
13	4.45	.445Ω					
14	4.70	.470Ω					
15	4.35	.435Ω					
17	4.70	.470Ω					
18	4.50	.450Ω					
19	4.20	.420Ω					
19	4.50	.450Ω					
20	5.00	.500Ω					
21	4.90	.490Ω					
21	4.65	.465Ω					
45	4.70	.470Ω					
46	4.75	.475Ω					
47	4.40	.440Ω					
48	4.50	.450Ω	>100K MΩ				

REMARKS: Milliammeter Sensitive Research ~~X16397~~ X6622 CAL 2/63
Millivoltmeter Sensitive Research X 16399 CAL 2/63
Megohmmeter General Radio R315 9-62

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A. A. L.		R. Markussen	3/20/63		

RAD 6-086
6-60

AVCO CORPORATION | **research and advanced development division**
201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST: DETONATOR ASSEMBLY PT NO 400612-1 400623 (connectors installed)

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G-310-010-0002	NO-FIRE CURRENT	

S/N	CURRENT	TIME	RESULTS				
1	1 AMP	15 SEC	NO FIRE				
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
17							
18							
19							
19							
20							
21							
21							
45							
46	1.6 AMPS	0	FIRED	*			
47	1 AMP	15 SEC	NO FIRE				
48							

REMARKS: MILLIAMPMETER WESTON ELECTRICAL S/N X1866 CAL 2/63

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A. A. L.		R Markussen	3/21/63		

APPENDIX II

AVCO DATA SHEETS: DETONATOR CORD

RAD 6-006
4-58

Avco CORPORATION | research and advanced development division
201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST

DETONATING CORD PT NO. 400618

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G310-010-0002		

SERIAL NO. OF CORD	SPECIMEN DESIGNATION						
6006	A	A1	TWELVE ONE-FOOT SPECIMENS WERE				
6007	B	B1	SELECTED FROM SIX TWENTY-FOOT LENGTHS				
6009	C	C1	OF DETONATING CORD TO BE USED FOR				
6010	D	D1	TESTING.				
6011	E	E1					
6013	F	F1					

REMARKS:

Detail Equipment Spec RAD-A 55105 B

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A. A. L.		R. Markussen	3/18/63		

RAD 6-006
4-60

AVCO CORPORATION | research and advanced development division
201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST
DETONATING CORD PT NO 400618

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G-310-010-0002	SHOCK TEST	

THREE DETONATOR CORDS DESIGNATED AS A, B, & C,
WERE SUBJECTED TO A SHOCK TEST, WHICH CONSISTED
OF THREE TWENTY FOOT DROPS IN THE VERTICAL & HORIZONTAL
POSITION

THIS TEST WAS CONDUCTED ACCORDING TO SPEC.
RAD-H551058 A Rev

REMARKS:

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A. A. L.		R. Markussen	3/18/63		

RAD 6-000 4-60

Avco CORPORATION | research and advanced development division
201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST

DETONNATING CORD PT NO 400618

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G-310-010-0002	IMPACT TEST	

THREE DETONNATING CORDS DESIGNATED AS D1, E1, & F1 WERE SUBJECTED TO AN IMPACT TEST WHICH CONSISTED OF DROPING A ONE INCH DIAMETER BAR WEIGHING FIVE POUNDS FROM A HIGHT OF THIRTY INCHES INTO THE MIDDLE OF THE CORD

THIS TEST WAS CONDUCTED ACCORDING TO SPEC RAD-A56105 ~~A~~ B

REMARKS:

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A. A. L.		R Markussen	3/18/63		

RAD 6-006
4-60

AVCO CORPORATION | research and advanced development division
201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST
DETONATING CORD PT NO. 400618

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G310-010-0002	TEMPERATURE TEST	

THREE DETONATOR CORDS DESIGNATED AS D, E, & F WERE SUBJECTED TO A TEMPERATURE OF 300°F FOR SIX HOURS.

NO DEFECTS WERE OBSERVED AFTER THE COMPLETION OF THIS TEST

THIS TEST WAS CONDUCTED ACCORDING TO SPEC RAD-~~A~~B 551058

REMARKS:

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
		R. Markussen	3/19/63		

RAD 8-086 4-60

AVCO CORPORATION | research and advanced development division
201 Lowell Street • Wilmington, Mass

LABORATORY DATA SHEET

PAGE 5 OF 6

TITLE OF TEST

DETONATING CORD P.T. NO: 400618

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO.	DATA SECURITY CLASS
G-310-010-0002	SHOCK TEST	

THREE DETONATING CORDS DESIGNATED AS D, E, + F WERE SUBJECTED TO A SHOCK TEST, WHICH CONSISTED OF THREE TWENTY FOOT DROPS IN THE VERTICAL + HORIZONTAL POSITION.

THIS TEST WAS CONDUCTED ACCORDING TO SPEC RAD-A65/1058.B

THIS TEST WAS PERFORMED AFTER THE 300°F TEMPERATURE TEST

REMARKS:

TEST ENGINEER	DATE	TEST WITNESS	DATE	TEST WITNESS	DATE
A.A.L.		R. Markussen	3/19/62		

RAD 6-008A 4-59

AVCO CORPORATION

research and advanced development division

201 Lowell Street • Wilmington, Mass.

LABORATORY DATA SHEET

TITLE OF TEST

Susceptibility Tests of Primers A, B, + C.

TEST WORK ORDER NO.	LABORATORY TEST PLAN NO	DATA SECURITY CLASS

Test	Frequency From	Frequency To	Input Level	Change in Indication	Malfunction	Degredation of Performance
RF Radiated	.15 MC	50 MC	.1 Volts	None	None	None
RF Radiated	50 MC	480 MC	.1 Volts	None	None	None
RF Radiated	450 MC	1200 MC	.1 Volts	None	None	None
RF Radiated	1 KMC	2.29 KMC	.1 Volts	None	None	None
RF Radiated	2.14 KMC	4.34 KMC	.1 Volts	None	None	None
RF Radiated	4.20 KMC	7.74 KMC	.1 Volts	None	None	None
RF Radiated	7.36 KMC	10.00 KMC	.1 Volts	None	None	None
AC Induced	400 CPS	400 CPS	20 Amps	None	None	None

REMARKS

MIL-I-26600 Interference Control Equipment

	DATE	TEST WITNESS	DATE	TEST WITNESS	
	3-19-63	G. H. Carter			

Space Systems Division, Air Force Systems Command, Los Angeles, Calif.
Rpt. No. SSD-TDR-63-91-III. TASK 3. LINEAR SHAPED CHARGE SEPARATION TESTS. Qtrly rpt No. 1, 20 Apr. 63, 27 p. incl. illus., tables.
Unclassified Report

A report is presented of first quarter study, development, and the laboratory test of a flexible linear shaped charge (FLSC) for space vehicle stage separation. The pyrotechnics have been tested for susceptibility to handling shock and electromagnetic radiation. Alignment verification by radiograph has been successful.

1. Charge, vehicle stage separation explosive
2. Vehicle, stage separation
3. Shock due to vehicle stage separation

I. AFSC Project P706, Task 3
II. Contract AF04(695)-273
III. Radio Corporation of America, ACCD, Burlington, Mass.
IV. Engel, S.J.; Dulevskis, S.; Batchelder, R.R.
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